54TH CONGRESS, 2d Session. } HOUSE OF REPRESENTATIVES. { DOCUMENT No. 177.

MATERIAL OF MINOR COINS.

LETTER

FROM

THE SECRETARY OF THE TREASURY,

TRANSMITTING

A REPLY TO THE RESOLUTION OF THE HOUSE OF JUNE 9, 1896, RELATING TO THE MATERIAL OF MINOR COINS.

JANUARY 12, 1897.—Referred to the Committee on Coinage, Weights, and Measures and ordered to be printed.

TREASURY DEPARTMENT, OFFICE OF THE SECRETARY,
Washington, D. C., January 7, 1897.

SIR: I have the honor to acknowledge the receipt of the following resolution, passed by the House of Representatives June 9, 1896:

Resolved, That the Secretary of the Treasury be requested to communicate to the House, at the commencement of the next session, such information as he may have, or may be able to obtain meantime, as to the comparative merits and advantages of pure nickel, nickel alloy, aluminum combined or alloyed with other metals, and of copper bronze as material for our minor coins; and for the purpose of making such information as full and complete as possible the Secretary of the Treasury is authorized to have struck such experimental minor coins of the metals above mentioned, pure and in combination with other metals, as he may deem necessary and proper, and is requested to communicate to the House the results and conclusions derived from such experimental coinage.

Before giving the results of experiments made in compliance with the above resolution, it is deemed proper to refer briefly to former experiments of different alloys made for the 1 and 5 cent pieces, especially the 1-cent piece.

From the records of the Department it appears that the advisability of manufacturing 1-cent pieces from material other than copper was considered at different periods, and experiments were made by the mint at Philadelphia of different alloys, particularly from 1850 to 1854.

The result of these experiments was that in 1853 the Director of the Mint recommended that an alloy containing 95 per cent of copper and 5 per cent of tin and zinc, in proper proportions, be substituted in place of the copper used in the manufacture of the 1-cent pieces. The recommendation met with the approval of the Secretary of the Treasury, and a bill was prepared and submitted to Congress providing for the coinage of the 1-cent pieces of the weight of 96 grains, to be composed of

95 per cent of copper and 5 per cent of tin and zinc. Other experiments, however, were made, and before the passage of the bill it was decided that an alloy containing 88 per cent of copper and 12 per cent of nickel would be more suitable than that of 95 per cent of copper and 5 per cent of tin and zinc. The recommendation of the Director of the Mint was approved by the Secretary of the Treasury, the result of which was that the act of 1857 provided for the coinage of the 1-cent pieces from an alloy of this formula, the same to be of the weight of 72 grains.

From 1857 until 1864 the 1-cent pieces struck were all made from this alloy, but it was found to be hard and difficult to work.

The Director of the Mint in his annual report for 1863, recommended that an alloy containing 95 per cent of copper and 5 per cent of tin and zinc in suitable proportions should be substituted for that of 88 per cent of copper and 12 per cent of nickel. This was the same as the alloy originally recommended in 1854. The recommendation of the Director of the Mint was approved by the Secretary of the Treasury, and the result was the passage of the act of April 22, 1864, providing for the coinage of the 1-cent pieces from such alloy, and which has since continued to be used.

From 1857 to 1865 numerous experiments were made of alloys, with a view of finding one suitable for the 5-cent nickel coins. After a number of such experiments, it was decided that the most suitable alloy for this purpose was one containing 75 per cent of copper and 25 per cent nickel, which is the same as the alloy used at present for the coinage of the 5-cent pieces.

USE OF ALUMINUM.

In 1863 the Director of the Mint called attention of the Department to the propriety of substituting coins manufactured of aluminum of the denomination of 5 and 10 cents, to take the place of the fractional notes of these denominations in circulation at that time. In 1864 a number of experiments were made with an aluminum alloy containing 99 per cent of silver and 1 of aluminum, with a view of ascertaining the fitness of the same for coins of the denomination of 5 and 10 cents. The alloy, however, did not work satisfactorily, as it was found that it not only discolored rapidly but was difficult to work.

An alloy of thirteen parts copper and one of aluminum was also tried, as well as another of nineteen parts copper and one of aluminum.

These two alloys gave the coins a gold color, and the metal was found to be very hard and it was difficult to procure perfect impressions.

At the request of the National Academy of Science, and by direction of the Secretary of the Treasury, a number of other experiments were made in 1864, with aluminum, under the auspices of Dr. John Torrey, Professor Bache, Professor Henry, Dr. Barnard, and Professor Gibbs, members of the academy. For this purpose a bar of alloyed aluminum was furnished, which upon assay was found to contain nine parts of copper and one of aluminum. These experiments were made with a view of ascertaining the adaptability of aluminum alloys for coinage purposes, also to test the tenacity of the same as compared with copper. The composition was found to be very rigid under the rolls, requiring many annealings, and proved very refractory in working, so much so that perfect impressions of the coins were not obtained.

No further experiments were made after this date with aluminum alloy for coinage purposes until the experimental pieces called for by the resolution were struck.

In compliance with the resolution, experimental 5 and 1 cent pieces were struck at the Mint from pure nickel and 14 other alloys for each denomination, in the presence of Hon. Charles W. Stone, chairman of the Committee on Coinage, Weights, and Measures of the House of Representatives, the Director of the Mint, and the officers of the Philadelphia Mint. The results of these experiments are contained in the schedules attached hereto, marked Exhibits A and B.

The law enacted by Austria-Hungary August 2, 1892, provided that pure nickel should be used in the manufacture of the minor coins of the Empire, previously coined from copper, with a small percentage of silver, these latter coins to be withdrawn from circulation.

The director and chief engineer of the Austrian mint states that—

> Pure nickel for minor coins has many advantages: It does not change color, it is very hard and wears very well; receives a beautiful, clear impression; works well in the presses, does not oxidize, feels soft and velvety to the touch, is strongly magnetic, and is in every way far superior to every other metal or combination of metals for minor coinage.

It is also stated:

> That the plates (planchetts) from which the pieces are coined must be exposed beforehand to white heat in closed furnaces, in order to make them sufficiently soft.

The Swiss Government has used pure nickel for minor coins since 1887, which has been found not only to work satisfactorily, but is regarded as superior to those manufactured prior to 1887 from an alloy of nickel and copper.

Since 1894 pure nickel has been used by Italy for minor coinage, and has proven satisfactory.

The pure nickel blanks used in striking experimental 5 and 1 cent pieces were imported from Austria, as they could not be obtained in this country. The analysis furnished by the Austrian Government of the nickel used for the minor coins of that country is as follows:

	Per cent.
Nickel	97.37
Cobalt	1.30
Copper	.32
Iron	.80
Silicum	.14
Carbon	.07

An excess of cobalt darkens the color, while an excess of iron and carbon makes the metal too brittle.

Pure nickel being much harder than the alloy used at present for the minor coinage would not abrade so rapidly. Whether it would retain the color better could only be determined by time, and those competent to judge are of the opinion that a coin of pure nickel after being in circulation for a short period could not be distinguished from one of the present alloy.

On comparison of the experimental pieces struck from pure nickel with the 5-cent pieces of the alloy now used, "the soft and velvet-like touch" ascribed to coins struck from pure nickel is not apparent. This may be due to the fact that the blanks were not exposed to a white heat in a closed furnace before being struck, as is the practice in the mints of Austria-Hungary.

I find, upon examination of the report of the Committee on Coinage, Weights, and Measures, in submitting the resolution to the House, the following:

> It has further been represented to your committee that aluminum, with a small alloy or mixture of nickel or silver or German silver, makes an excellent coinage material; that it is light, cleanly, attractive in appearance, retains its luster, and wears well.

Authorities having the most extensive practical acquaintance with the qualities of aluminum, however, recommend as an alloy a mixture of a small quantity of molybdenum, thus making a material in all respects excellently adapted, as it is alleged, to the purposes of coinage, and practically proof against counterfeiting.

The blanks of aluminum alloys submitted, in addition to being very light, were found on trial to be very soft, the effect of which was to produce a burred edge before the design is brought up, indicating the clogging of the dies with the metal.

The alloys of aluminum submitted for trial were in no sense adapted for coinage purposes.

While a number of the alloys submitted for test were found to work satisfactorily, it is not believed that any of them would be an improvement upon the alloys at present in use.

It is, however, recommended that authority be granted to make further experiments with a view to finding an alloy that would be an improvement upon that used in the manufacture of the bronze 1-cent pieces. It is desirable that any alloy adopted should be one in which the present minor coins could be made to form a part, otherwise they would upon redemption become so much old material in the hands of the Treasury, realizing when melted and sold a comparatively small sum compared with their present face value.

On the 31st of December, 1896, there were outstanding $8,166,065 in bronze 1-cent pieces. These pieces, when first issued from the Mint, contained 5,319,608 pounds of copper and 279,979 pounds of tin and zinc.

The amount of 5-cent nickels outstanding at the same date was $13,964,892, and when first issued contained 2,308,995 pounds of copper and 769,665 pounds of nickel.

The experimental pieces struck have been handed to Hon. Charles W. Stone, chairman of the Committee on Coinage, Weights and Measures of the House of Representatives.

Respectfully, yours,

J. G. CARLISLE, *Secretary.*

Hon. THOMAS B. REED,
Speaker of the House of Representatives.

EXHIBIT A.—*Schedule of experimental 5-cent pieces struck at the Mint of the United States at Philadelphia, Pa., December 12, 1896.*

Sample number transmitted.	Number of pieces.	Alloy.	Grains troy.		Number of pieces in avoirdupois pound.		Price per pound, avoirdupois.		Remarks.
			Submitted.	Standard.	Submitted.	Standard.	Submitted.	Standard.	
			Weight.	*Weight.*			*Cents.*	*Cents.*	
1	10	Pure nickel.....	77	77.16	91	93	65	31.94	Difficult to work and hard on the dies.
*2	10	Copper..... .60 Zinc..... .15 Nickel ..... .25	77.2	77.16	91	93	42.61¼	31.94	Works satisfactorily.
*3	10	Copper..... .60 Zinc..... .20 Nickel ..... .20	79.8	77.16	88	93	36.02	31.94	Do.
*4	10	Copper..... .63 Zinc..... .19 Nickel ..... .18	79	77.16	88	93	34.06	31.94	Do.
5	10	Standard 5 cents. Copper. .75 Nickel . .25	77.16	77.16	93	93	Contract 1897. 31.94	31.94	Present alloy, and satisfactory.
6	10	Pure aluminum ..	23.2	77.16	302	93	50–55	31.94	Too soft. Produces a burred edge before the design is brought up. Indications of dies being clogged.
7	10	Aluminum .98.78 Iron..... .40 Silicon ..... .45 Copper..... .37	23	77.16	302	93	50	31.94	Do.
8	10	Aluminum .96.94 Iron..... .65 Silicon ..... .38 Copper..... 2.03	23.5	77.16	302	93	50	31.94	Do.
9	10	Aluminum .96.74 Iron..... .45 Silicon ..... .31 Manganese. .56 Copper 1.94	23.5	77.16	302	93	50	31.94	Do.
10	10	Aluminum .96.94 Iron..... .65 Silicon ..... .38 Copper..... 2.03	23	77.16	302	93	50	31.94	Do.
11	10	Aluminum .96.74 Iron..... .45 Silicon ..... .31 Manganese. .56 Copper..... 1.94	22.5	77.16	302	93	50	31.94	Do.
12	10	Copper..... .66 Nickel ..... .18 Zinc ..... .16	77	77.16	91	93	†45	31.94	Practically "too hard" to coin.
13	10	Copper..... .66 Nickel ..... .18 Zinc ..... .16	87	77.16	81	93	†45	31.94	Do.
14	10	Silver..... .03 Copper..... .61 Nickel ..... .18 Zinc ..... .18	79.50	77.16	89	93	64	31.94	Works satisfactorily.
*15	10	Copper..... .65 Nickel ..... .20 Zinc ..... .15	78.50	77.16	89	93	37	31.94	Do.
16	10	Struck from standard 5-cent die, 1896: Copper.. .75 Nickel .. .25	77.16	77.16	93	93	31.94	31.94	Present alloy.

*Partake of the nature of German silver in general. †About.

EXHIBIT B.—*Schedule of experimental 1-cent pieces struck at the Mint of the United States at Philadelphia, Pa., December 12, 1896.*

Sample number transmitted.	Number of pieces.	Alloy.	Grains troy.		Number of pieces in avoirdupois pound.		Price per pound, avoirdupois.		Remarks.
			Submitted.	Standard.	Submitted.	Standard.	Submitted.	Standard.	
			Weight.	*Weight.*			*Cts.*	*Cts.*	
1	10	Pure nickel.....	46	48	152	146	65	19.94	Difficult to work and hard on the dies.
2	10	Copper..... .83⅓ Zinc..... .16⅔	47.3	48	148	146	20.2	19.94	Works satisfactorily, but is essentially a cross alloy.
3	10	Copper..... 88.95 Zinc..... 10.55 Tin..... .05	47.9	48	146	146	21.95	19.94	Do.
4	10	Pure aluminum ..	14.8	48	473	146	50 to 55	19.94	Same as No. 6 of 5-cent alloy.
5	10	Standard 1 cent: Copper 95 Tin ... 03 Zinc .. 02	48	48	146	146	19.94	19.94	Present alloy.
6	10	Copper.... 66 Nickel .... 18 Zinc 16	50	48	140	146	*45	19.94	Practically too hard to coin.
7	10	Copper.... 66 Nickel .... 18 Zinc 16	47	48	149	146	*45	19.94	Do.
8	10	Aluminum 98.78 Iron ..... .40 Silicon.... .45 Copper.... .37	14	48	463 to 500	146	50	19.94	Too soft. Produces a burred edge before the design is brought up. Liable to clog the dies.
9	10	Aluminum 96.94 Iron ..... .65 Silicon .... .38 Copper.... 2.03	13.5	48	462 to 511	146	50	19.94	Do.
10	10	Aluminum 96.74 Iron ..... .45 Silicon.... .31 Manganese .56 Copper.... 1.94	15	48	467	146	50	19.94	Do.
11	10	Aluminum 96.94 Iron..... .65 Silicon .... .38 Copper.... 2.03	14	48	462 to 500	146	50	19.94	Do.
12	10	Aluminum 96.74 Iron..... .45 Silicon .... .31 Manganese .56 Copper.... 1.94	14	48	462 to 500	146	50	19.94	Do.
13	10	Copper.... 93 Tin ..... 6.5 Phosphorus .5	50	48	140	146	23	19.94	Works satisfactorily; phosphor bronze introduced.
14	10	Copper.... 95 Tin ..... 4.6 Phosphorus .4	50	48	140	146	22	19.94	Do.
15	10	Copper.... 95 Tin 5	50	48	140	146	20	19.94	Bronze pure and simple.
16	10	Struck from standard 1-cent die, 1896: Copper 95 Tin ... 3 Zinc .. 2	48	48	146	146	19.94	19.94	Present alloy.

*About.